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THE BASILICA SPIDER AND HER SNARE.

BY REV. HENRY C. MCCOOK.

In the month of July, 1877, I was encamped upon the hills of the Colorado River, a few miles southwest of Austin, studying the habits of the Agricultural and Cutting Ants of Texas. A limited portion of time was given to observations upon spiders, in the course of which the object of this sketch was discovered. Her snare was hung about two feet from the ground, upon a bush which stood in the midst of a grove of young live-oaks. This snare had the composite structure imperfectly represented in Fig. 1. The general form of the snare was that of a pyramid, the upper part of which, *r*, was a mass of right lines knotted and looped, and crossing in all directions. Within this mass was suspended an open silken dome, *d*, constructed of a vast number of radii, crossed at regular intervals by concentrics after the manner of the snare of the common orb-weaving garden spider. The radii were about $\frac{1}{16}$ th of an inch apart at the bottom or circumference of the dome. The concentrics extended entirely and with equal regularity to the summit. They did not cross the radii in circular lines, but presented that notched appearance which is observed in the webs of some orb-weavers, particularly those whose snares are horizontal, as for example, Hentz's *Epeira hortorum*. The meshes formed by the radii and spirals had thus much the shape of the meshes in a fisherman's net. (See Fig. 9, *n*.) The diameter of the dome was from 7 to 8 inches at the base, the height nearly the same. It was suspended in the midst of the mass of right lines by silken guys of like character, which thoroughly steadied the delicate structure, and perfectly preserved its form. Beneath the dome, from two to three inches removed, was a light sheet of cobweb, *c*, irregularly meshed of waving and straight lines. It had a decided convexity upward, and was supported like the dome above it, and of which it seemed to be a protecting curtain, by silken threads or guys, so stretched as exactly to meet this purpose.

Of the many specimens of spinning-work which I have noted and studied, I have never seen one so beautiful as this. It was with real regret that this rare piece of spider architecture was

destroyed, after it had been sketched, in order that the architect, herself one of the most beautiful of her order, might be collected for the cabinet. The species has been named *Epeira basilica*, her architecture having suggested the dome-bearing temples of the earlier Christians of the Eastern Church.

Fig. 1.

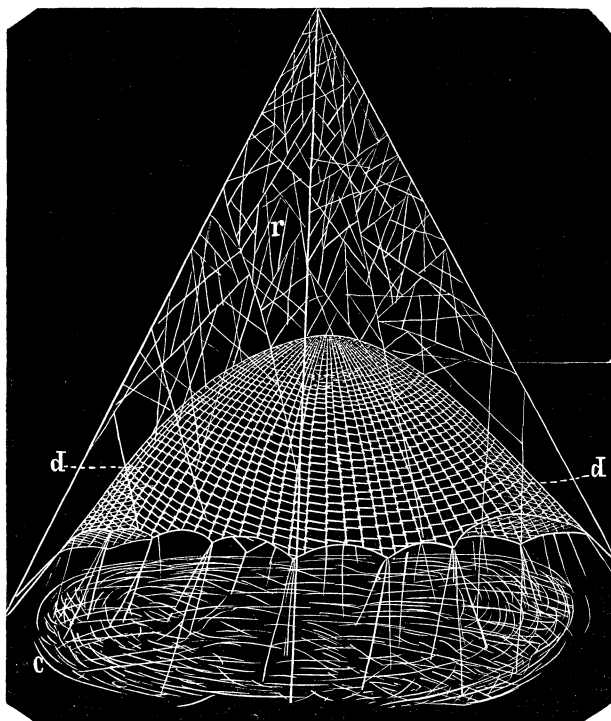
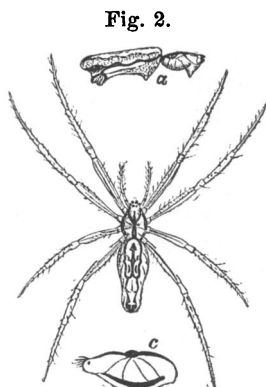


Fig. 1. Snare of *Epeira basilica*. d. Dome; c. Curtain beneath; r. Retitelarian snare.

It would be an interesting study to the architect of human habitations, to uncover the principles upon which this silken basilica was reared. He would doubtless find admirable adaptation of means to ends; he would be likely to meet methods quite familiar to himself, and perhaps stumble upon some of which he is yet ignorant. He certainly would have occasion to marvel that a structure so stable could be wrought out of such fragile material as spider silk, and that the delicate dome could be so poised in

the midst and by the help of silken threads as to preserve its perfect form. Perhaps he would rise from the study with a higher appreciation of the qualities and character of despised Arachne.

Nor would he find the creature herself unworthy of admiration as she hangs inverted within and just below the summit of the dome. The term beautiful is rarely associated with individuals of her order, but it may properly be used in this case. The fore part of the body, cephalothorax, is of a golden-yellow color, bordered and marked with blackish bands. The legs are a delicate green, having the thighs marked by blackish longitudinal bands,



Epeirabastica, magnified. *a*. Profile; *c*. Cephalothorax.

and blackish annuli at the joints. On the back of the abdomen the colors within the blackish marginal lines are as follows: At the base, next the cephalothorax, a snowy white; the middle lobes are a light yellow, the lower lobes and the cruciform figure (showing white in the illustration), are a golden-yellow. The bands and markings on the side of the abdomen, a view of which is given at *a*, Fig. 2, are in the following order from the top, viz., crimson, white, dark-green with light-green edges, blackish to dark green, yellow. Even the most fastidious lady would find it hard for her nerves to prompt a cry of

“horrid spider!” against a creature bearing such delicate colors and dwelling in such a fairy-like domicile. In sooth, the ill reputation of spiderhood is had from those forms that affect the neighborhood of man, as cellars, out-houses, and kitchen walls. These are among spiders what vultures are among the birds. If one would see the graceful forms and beautiful colors, he must follow the creature to her favorite haunts in groves, woods, by streams and among meadow grasses, where he shall find many a species that may rival even the butterflies in brilliancy of coating.

Fig. 3.



Eyes of *E. basilica*, magnified.

However, the special point of interest about the Basilica spider is neither its architectural skill nor its fair colors. Its chief importance in the mind of the araneologist is that it seems to form

a perfect link between the orb-weaving and the line-weaving spiders in the characteristic spinning-work of the two groups. The main object of this paper is to exhibit this fact.

Some of the orb-weavers (*Orbitelariæ*) have associated with their geometrical snare the characteristic snare of the line-weavers



(*Retitelariæ*), which is a mass of right lines knotted together at various angles, and forming at once the home and the snare of the animal. The web of the labyrinth spider, *Epeira labyrinthea* Hentz, is an example of this, common to at least our Eastern States. Another of these composite webs is that of the *Epeira globosa*, Keyserling, Fig. 4, a description of which is appended to this paper.¹

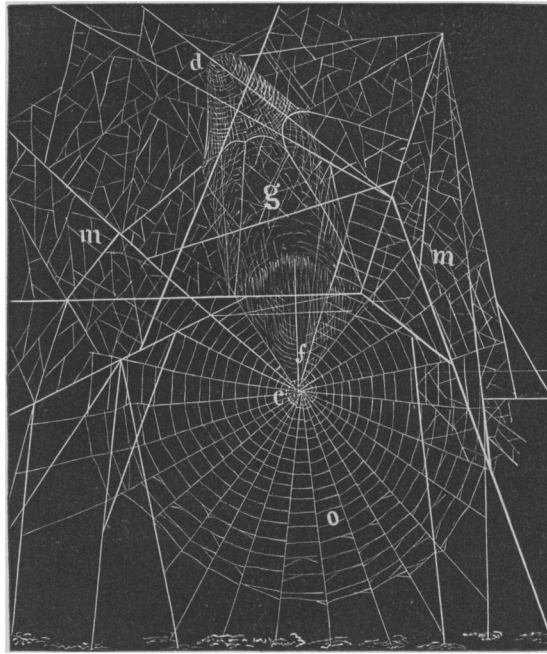
The curious manner in which the snares of the *Orbitelariæ* and *Retitelariæ* blend may be sufficiently shown by Fig. 5, which illustrates the spinning-work of this spider, as compared with Figs. 1 and 6.

It will be remembered that the simple characteristic web of the orb-weaver is the vertical geometric orb represented at Fig. 5, *o*. In that example, however, there is a slight variation, as seen at *f*, in a break in the radii, leaving what is known as a free radius. The bell-shaped den of thick white silk, *d*, within which the spider constantly dwells, is not peculiar to this species; most of the orb-weavers have a similar tent, or some floss-upholstered crevice, hole, or leafy nest, within which they conceal themselves frequently or habitually. But *Epeira globosa* exhibits two other remarkable additions to the simple orb. First, there is an open but quite distinct tube, *g*, attached to the mouth of the den, *d*, from which it reaches almost to the centre, *c*, of the orb to which the free radius is fastened. The free radius runs through or along the "floor" of this tube, is continually kept taut, and is clasped at the upper end by the fore feet of the spider. An insect struggling in the orb thus communicates the motion to the vigilant creature in the den, who dashes along her covered gangway, *g*, to seize her prey. This gangway is at times imperfect, shortened, or even wholly omitted, but is frequently found as in the figure, which was drawn from nature. In this bell-shaped den and connecting tube one may see a germ or modification, or suggestion,

¹ See Proceedings Acad. Nat. Sciences, Phila., p. 201, 1876.

of the dome-shaped sheet-web of the *Linyphioidæ*. See Figs. 6 and 7.

Fig. 5.



Snare of *Ep. yvobosa*. d. Den; g. Gangway; m. Mass of right lines above; f. Free radius; o. Orb; c. Central.

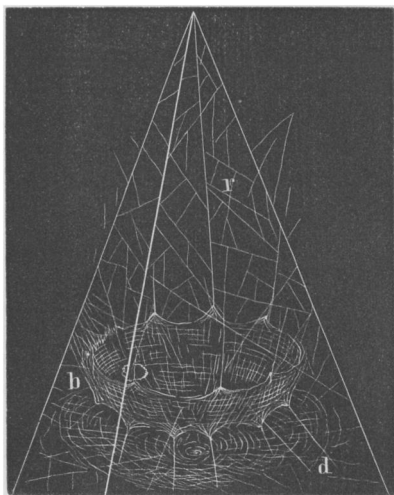
The second addition to the typical orb web is the mass of right lines, *m m*, which surrounds the den and the gangway, and incloses the upper part of the orb. This is an exact retitelarian snare, as will be readily recognized by any ordinary observer of the cobwebs (for the most part of the *Theridioidæ*), which form the bulk of those infesting the angles of our kitchen, chamber, and out-house walls. It is probable that the purpose of this snare is to suspend and keep in poise the dwelling place, *d*, and to protect the spider therein and on the gangway from the assault of invading wasps and other enemies of the order. At least I have not observed it to be used by the adult spider for the capture of prey, the orb being the chief dependence for that. These lines appear also to serve the young spiderlings for a sort of play-ground and foraging field for small insects.

We have thus our first distinct connecting link between the spinning work of orb-weavers and line-weavers, established at the typical web of the latter as shown especially in the snares of the family *Theridioidæ*.

The second and most noteworthy link, which indeed constitutes in the web of *E. basilica* a complete inter-blending of the groups, is at the snares of the *Linyphioidæ*. The genus *Linyphia* is one of the largest and most important genera of the line-weavers. In order to show the steps by which the two groups approach each other in habit, some explanation of the spinning work of the *Linyphiæ* is necessary. Their webs differ from the *Theridioidæ* substantially in the addition of a sheet-like web to the web of right lines; indeed the right lines take a subordinate or subsidiary place, and the sheet appears to be the real snare. There are three common variations of form. First, a plain sheet of thin silk, attached to

the under part of leaves, or suspended between twigs, as in the web of *Linyphia costata*. Second, the web represented at Fig. 6, the snare of *Linyphia communis*. It is composed of a mass of right lines, *r*, to which is suspended a bowl-like sheet, *b*, beneath which again is a dish-shaped sheet, *d*, of more open spinning work with the concavity upward as in the bowl. The snare from which the figure was drawn (Aug. 15, 1877, Delaware Co., Pa.) had a total height of from 12 to 14 inches; the diameter of the bowl was 6 to 7 inches, its depth $1\frac{1}{2}$ to 2 inches. The spider hung,

Fig. 6.



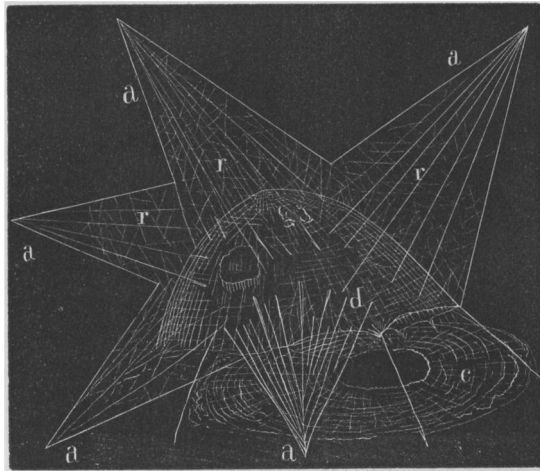
SNARE OF *Linyphia communis*. *b*. Bowl; *d*. Underlying dish; *r*. Snare of right lines.

inverted, to the lower surface of the bowl, and was thus protected from assault by the underlying dish, *d*.

A third variation is that of the beautiful snare of *Linyphia marginata* (*L. marmorata* of Hentz), which is in form precisely that of Fig. 6, except that the bowl becomes a dome; that is, the

sheet, *b*, has the concavity downward instead of upward, and the dish, *d*, undergoes the same change. In other words, the web of *L. marginata* has the exact form of the Basilica spider's web, except that in the latter the dome (*d*, Fig. 1) is constructed of open, regular meshes, formed by the intersection of radiating ribs of silk by notched concentrics. In the former (*L. marginata*), this bowl is woven of irregularly placed threads into a thin sheeted web. The lower curtains, *cc*, and the upper retitelarian web, *rr*, are substantially the same in both. That is to say, the typical character of the orb-weaver's snare, viz., regular radiating lines regularly crossed by spiral lines, appears in the web of *Ep. Basilica* without any other change from a fixed generic Linyphian web. Fig. 7 represents the snare of *L. marginata* as drawn from an example suspended within an opening in a pile of pine boards at Bellwood, in the Allegheny Mountains. The snare commonly has the pyramidal form of Fig. 6 when hung among bushes, weeds, and grasses, its most natural site.

Fig. 7.



Snare of *Linyphia marginata*. *a a*, *rr*. Retitelarian snare, branched; *d*. Dome;
c. Lower curtain.

We may trace this interesting analogy from another point in the group of orb-weavers, and find yet further coincidences. It will be noticed that the typical orb of the *Orbitelariæ*, as represented at *o*, Fig. 5, is vertical, while the corresponding section of

the web of the Basilica spider Fig. 1, *dd*, may be properly described as horizontal. That is to say, if a horizontal orb attached at the circumference in the usual way, were to be lifted up by a thread fastened in the centre, it would assume the shape of the dome in the web of the Basilica spider. In point of fact, this effect might be produced from the characteristic snares of certain species of the orb-weavers, which, as has already been stated, are placed in a horizontal plane, at times more or less inclined by the stress of circumstances. Our most common examples of these species are the Stilt spider (*Epeira grallator*), and the Orchard spider (*Ep. hortorum*). Fig. 8 represents the snare of the latter.

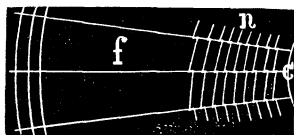
Fig. 8.

Snare of *Epeira hortorum*.

The diameter of the orb is quite habitually from seven to nine inches. The spider, one of the most beautiful of the order, hangs inverted at the open central space, Fig. 9, *c*, whose diameter is about the length of her body. Next to the open central is a series of concentrics which are most frequently ten in number.

They are closely drawn, the ten covering a space of one-half to one-third of an inch. These concentrics have the same notched arrangement as the spirals in the dome of the Basilica spider. (See

Fig. 9.



Section of horizontal snare of Orchard spider. *c*. Central; *n*. Notched spirals; *f*. Free space.

n, Fig. 9 compared with Fig. 1.) Next follows a free space, *ff*, about one inch in width, beyond which are spirals, in number usually about thirty, which cross the radii at right angles in the usual way. The number of radii generally about corresponds with that of the spirals, and at the circumference they are from one-sixteenth to

one-thirty-second of an inch apart. Beneath the orb, reaching downward sometimes ten inches, is a mass of reticularian lines, Fig. 8, *rr*, which for the most part extend under but two sides of

the orb. The spinning work of this mass is much more open than the corresponding objects, *c c*, in the Linyphian webs above described, but the resemblance is marked. If one were to fasten the thread to the central point of the orb in the orchard spider's web, Fig. 8, and gradually lift it until the orb should assume the dome shape, he would have a snare very strongly resembling that of the Basilica spider. The difference would be in the absence of the retitelarian web above and around the dome, and the presence of the peculiar arrangement of the spirals just noted.

We have thus traced the analogy between the spinning work of this species of the orb-weavers, and that of the line-weavers, in these several particulars; *first*, in the dome-shaped snare and dwelling place; *second*, in the mass of retitelarian lines placed around and above the dome; *third*, in the sheet-like curtain underneath the dome. Our *E. basilica* is seen to possess all the characteristics of the families of the *Retitelariæ*, viz., right lines and sheet-web in exact detail, and dome-shaped web in outline. It also is seen to possess the chief characteristic of the *Orbitelariæ*, viz., the geometric web, or radiating lines regularly crossed by concentrics; to combine, moreover, in its dome structure the vertical and horizontal forms of the geometrics, and to have the notched arrangement of the spirals peculiar to webs of some species. The Basilica spider may therefore be regarded as well nigh, if not completely, bridging the space between the spinning economy of these two great groups or sections of the *Araneæ*.

It may be added that there is a close resemblance in structure between certain of the orb-weavers and line-weavers. This is so striking in Koch's genera *Meta* and *Zilla*, that they have been classed with both sections. While, therefore, at one point we find the sections closely approaching each other in structure, in another we see them inter-blending in habit. A comparison between the structures of the two creatures, *L. marginata*, and *E. basilica*, whose spinning works have such marked likenesses, shows, however, no such close structural resemblance.

ARANEÆ.

ORBITELARIÆ.

EPEIRINÆ.

1. *Epeira basilica*, n. sp. ♀. Fig. 2, p. 126. Length of body .23+ inch.

The cephalothorax is oval, longer than broad; color livid yellow, with irregular black bands around each margin, and a medial band, black, extending to the eye-space; the base is rounded, the grooves and indentation distinct. Beneath the sternum is a long oval, pointed toward the abdomen, wide black bands at the margin, inclosing a scalloped, yellow medial band, in which are two parallel rows of blackish dots, of three each. The head is slightly elevated beyond the thoracic juncture, but gradually depressed toward the eye-space. The eyes are in two semicircular rows, Fig. 3, the inner row concave toward the front, the outer convex. The lateral eyes are in contact, the foremost being much the smaller. The four medial eyes form a quite regular parallelogram, somewhat longest longitudinally; these and the two inner lateral eyes are about equal. The eyes of the hind row are separated from each other by about the same distance. The distance between the anterior middle eyes is slightly less than between the posterior middle. The distance from the margin of the clypeus to the anterior middle eyes is about equal to one-half the distance between the anterior and posterior middle eyes. The falcæ are conical, vertical, slightly inclined inward, of a livid yellow color, touched with black at the tips. The maxillæ are gibbous, hairy at the edges, blackish. The lip is black, subtriangular, almost semicircular, rounded at the base into a concavity in the sternum. The palpi are yellow, with green annuli at the joints, the radial and digital joints well armed with long bristles, shorter, and more numerous at the tips which are armed with a strong pectinated claw. Legs 1, 2, 4, 3, the difference in the length of the 1st, 2d, and 4th pairs being very small; the 2d pair, if anything, a little the longest; the length of these is about $\frac{7}{16}$ of an inch; of the 3d pair about $\frac{5}{16}$ of an inch. The femur has numerous spinous bristles, arranged in spirals on the first two pairs, longest beneath, and numbering six. On the tibia and metatarsus are three spirals of long spines, each spiral having four spines. Short comb-like bristles continue to the claws along the meta-

tarsus and tarsus. The claws are of the typical *Epeira* number and form.

The color of the legs is green, with blackish rings at the joints; there are two blackish longitudinal bands or lines on the thigh, which are somewhat wider and more distinct on the first two pairs of legs. The abdomen is three-sixteenths of an inch in length, subcylindrical, overhanging the cephalothorax slightly, and at the apex, protruding above the spinning mammulæ. It is formed and marked as in the figure. The colors are as follows: above or on the back waving lines, crimson, except toward the apex, where they are blackish, inclose a lobed band, white at the base, yellowish at the middle lobes, and golden at the apex where it terminates in a cruciform figure. On the sides the order of color is, a crimson band; white; light green with dark green edges; yellow. Beneath, the abdomen is blackish with yellow dots and spots.

Habitat: Texas, near Austin.

2. *Epeira globosa*, Keyserling. Fig. 4, p. 127.

Verhandlungen des zoologisch-botanischen Vereins, XV. 1865, p. 820.

Length of body, ♀, one-fourth inch; ♂, three-sixteenths inch; width of abdomen of ♀, one-eighth inch.

The cephalothorax is of a uniform livid yellow color, convex, nearly smooth, cut off squarely at the base, rounded on the sides, highly compressed in front, the medial indentation deep. The head is prominent, slightly elevated, hairy. The eyes are in two transverse rows, the anterior row decidedly convex toward the front, the posterior nearly straight. The four intermediate eyes form a parallelogram of which the anterior side is longest by about one-half. The two anterior middle eyes are separated from each other by a distance at least twice as great as that which separates the two corresponding posterior eyes, and from these latter by a distance about equal to that which divides themselves from the margin of the face; they are black, as are also the lateral eyes, and are placed on tubercles. The lateral eyes are in contact, the hinder one the larger. The distance between the front lateral eye and the anterior intermediate is about one-half greater than the space between the two intermediate. The falcæ are conical, vertical, toothed; brownish, deepening into blackish toward the fang. The lip is triangular, but rounded on the base; the sternum is heart-shaped, the maxillæ rounded on the sides

and cut squarely at the tip. These last three parts are of a chocolate-brown color except a broad medial yellowish longitudinal band in the sternum. The legs are in order of length 1, 2, 4, 3, are armed with spines and bristles, and have three claws of the usual epeiroid structure. In color they vary, according to age, from olive green to livid yellow, with anuli, quite black on the tibia and metatarsus. The palpi are colored like the legs, and have a strong pectinated claw. The abdomen is hairy, reticulated, overhangs the cephalothorax. It is of an olive green or livid, and strongly marked on the back with a butterfly-like figure, white, with black edgings; a line of white spots extends along the sides on either side, beneath a black lateral band above the venter. Across the base of the abdomen in front extend two rows of black dots, the lowest the shorter.

The ♂ does not greatly differ from the ♀, but is smaller. The digital joint is a prominent bulb, covered with curved bristles, convex externally, less convex within, and compressed toward the tip. Just within the palm is a straight spine, pointing outward.

This spider makes a composite snare, as described and figured above, Fig. 5, being a vertical orb, with a free radius, and surrounded above with a snare of right lines.

Habitat: Eastern Pennsylvania and New Jersey. Probably the entire Atlantic coast.